

## Are diesel cars or hybrid cars better for the environment?

There is a great deal of discussion about which type of car, diesel or hybrid, is the best kind of car for the environment. Cars can affect the environment in several ways including the release of greenhouse gases and using petrol resources. There are advantages and disadvantages for both of the types and there are also other factors that people take into account when they choose a car.

Many of the sources of information about these two types of vehicle come from car magazines such as *Popular Mechanics* and *Auto Speed*. The articles in these magazines are written to provide the reader with information and advice about the cars they might want to buy. Overall they seem to be **reliable and unbiased**. There is also information about efficiency available from organisations such as the RACV. This is an organisation for motorists and would be a dependable source. There is also information available from the U.S. Environmental Protection Agency. This is a **reliable source**. Some of the information comes from the car makers themselves and it is likely to present only a **positive view for the cars** they make.

**Investigation**  
Demonstrates ability to critically and logically select and appropriately acknowledge information about the issue from a range of sources.

Hybrid cars have a combination of an engine run on petrol as well as an electrical system that helps with the acceleration and deceleration of the car. Because they have this combination of power systems, they are very economical to run. Hybrid cars have zero emissions when they are stopped at traffic lights and use very little petrol at low speeds. This is good for the environment because it means that fewer resources are used and there are fewer greenhouse gases released. The Hybrid Car Organisation says that 'hybrid cars produce 80% less harmful pollutants and greenhouse gases than comparable gasoline cars. This translates to less airborne pollutants and a cleaner earth'. (<http://www.hybrid-car.org/hybrid-car-emissions.html>)

**Knowledge and Understanding**  
Uses knowledge of science perceptively and logically to understand and explain social or environmental issues.

There are some claims that hybrid cars are not as fuel efficient when it comes to long distance driving because the batteries are heavy and this means that there is more fuel used in transporting them. If they are not as fuel efficient, then this reduces their environmental friendliness.

**Analysis and Evaluation**  
Demonstrates skills in systematically analysing and evaluating data about fuel efficiency from a range of sources.

The green vehicle guide provided by the Australian Government, shows the ten most fuel efficient cars.

| Model                               | Fuel Type   | Consumption |
|-------------------------------------|-------------|-------------|
| Mini Cooper D Hardtop 1.6L, 4 seats | Diesel      | 3.9L/100kms |
| Fiat 500 1.3L, 4 seats              | Diesel      | 4.2L/100kms |
| Smart fortwo 1.0L, 2 seats          | Petrol      | 4.4L/100kms |
| Citroen C3 1.6L, 5 seats            | Diesel      | 4.4L/100kms |
| Fiat Punto 1.3L, 5 seats            | Diesel      | 4.4L/100kms |
| Toyota Prius Hybrid 1.5L, 5 seats   | Elec/Petrol | 4.4L/100kms |
| Citroen C4 1.6L, 5 seats            | Diesel      | 4.5L/100kms |
| Audi A3 Sportback 1.9L, 5 seats     | Diesel      | 4.5L/100kms |
| Honda Civic Hybrid 1.3L, 5 seats    | Elec/Petrol | 4.6L/100kms |
| Fiat Ritmo 1.6L, 5 seats            | Diesel      | 4.6L/100kms |

<http://www.greenvehicleguide.gov.au/>

This shows that, in general, diesel cars are the most fuel efficient and that hybrid cars are next so that from the perspective of using petroleum resources, diesel cars are better. The U.S. Environmental Protection Agency has produced some data which shows a comparison between ordinary petrol cars and diesel cars. (<http://www.epa.gov/otaq/climate/420f05001.htm#calculating>)

They have shown that CO<sub>2</sub> emissions from a gallon of petrol = 2,421 grams x 0.99 x (44/12) = 8,788 grams = 8.8 kg/gallon. This is equivalent to 2322gm/litre. The CO<sub>2</sub> emissions from a gallon of diesel = 2,778 grams x 0.99 x (44/12) = 10,084 grams = 10.1 kg/gallon. This is equivalent to 2664gm/litre.

When fuel consumption is taken into account, for the best Diesel car and the best hybrid car, the carbon dioxide emissions would be 10390gm/100km (diesel) or 10217gm/100km (hybrid). This means that the carbon dioxide emission for a diesel car is 1.6% higher than for a hybrid car. This suggests that there is very little difference between the two types of car in terms of their greenhouse gas emissions.

However, one of the arguments against using diesel cars is the fact that they are smelly. They release NO<sub>x</sub> and SOF gases as well as particles into the atmosphere. In response to this, the Newsweek magazine (<http://www.newsweek.com/id/183150>) reports that there have been technological improvements made so that some diesels now almost as environmentally friendly as some convention cars that use unleaded petrol.

Some people complain that diesel cars are noisy. This means that this adds to noise pollution and this is not good for people or for the environment. On the other hand, hybrid cars are generally very quiet.

Battery packs for Hybrid cars have been described as toxic and there are claims that their disposal is difficult but nickel-metal hydride are recyclable and a hybrid car's rechargeable batteries usually come with an eight-year warranty and so would be expected to last for a reasonable length of time.

Lastly, there are some other factors which people consider when they are buying a car. Hybrid cars are more expensive to buy and in very cold weather the special tyres they have become hard and may be dangerous, sliding on cold roads. Drivers are also concerned that there is not always a diesel pump at service stations when it is time to fill up.

When people are trying to decide between buying a diesel car or a hybrid car and thinking of the environment, it would seem that there is not a clear cut answer. Hybrid vehicles are most useful when it comes to city driving because this is where they are most fuel efficient. Diesel cars seem to be better if a driver is likely to be doing a lot of long distance driving. This is because of the difference in fuel consumption and therefore greenhouse gas emissions of the two vehicles under different conditions.

**Knowledge and Understanding**  
Uses knowledge of science perceptively and logically to understand and explain social or environmental issues related to diesel and hybrid cars.

**Application**  
Applies scientific concepts and evidence from investigations to present substantiated personal views.

Word Count: 841

References:

<http://www.newsweek.com/id/183150> (accessed 26 June 2009)

<http://www.epa.gov/otaq/climate/420f05001.htm#calculating> (accessed 24 June 2009)

<http://www.hybrid-car.org/> (accessed 26 June 2009)

<http://usedhybridcaronline.com/hybrid-car-myths/> (accessed 26 June 2009)

<http://www.edmunds.com/advice/alternativefuels/articles/93338/article.html>

(accessed 27 June 2009)

<http://www.edmunds.com/advice/alternativefuels/articles/93338/article.html>

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[http://www.racv.com.au/wps/wcm/connect/racv/Internet/Primary/my+car/advice+\\_information/vehicle+operating+costs/car+operating+costs+2007/diesel+\\_hybrid+cars/](http://www.racv.com.au/wps/wcm/connect/racv/Internet/Primary/my+car/advice+_information/vehicle+operating+costs/car+operating+costs+2007/diesel+_hybrid+cars/) (accessed

26 June 2009)

#### **Additional Comments**

- The student has used calculations and a table in addition to prose to communicate knowledge and understanding of science coherently and highly effectively.
- The teacher would generally need to consider more than one assessment task to assess a student's ability to:
  - *critically and logically select and consistently and appropriately acknowledge information about science and issues in science from a range of sources (Investigation).*
  - *systematically analyse and evaluate data and other evidence to formulate logical and highly relevant conclusions (Analysis and Evaluation).*
  - *use appropriate scientific terms, conventions, formulae, and equations effectively (Application).*

## PERFORMANCE STANDARDS FOR STAGE 1 SCIENTIFIC STUDIES

|          | Investigation   | Analysis and Evaluation  | Application  | Knowledge and Understanding   |
|----------|---|--|--|---|
| <b>A</b> | <p>Designs and implements a logical, coherent, and detailed plan for a scientific investigation.</p> <p>Critically and logically selects and consistently and appropriately acknowledges information about science and issues in science from a range of sources.</p> <p>Manipulates apparatus and technological tools carefully and highly effectively using well-organised safe and ethical work practices.</p> <p>Obtains, records, and displays findings of investigations using appropriate conventions and formats accurately and highly effectively.</p> | <p>Uses perceptive and thorough analytical skills to examine connections between data, concepts, and issues in science.</p> <p>Logically evaluates procedures and suggests a range of appropriate improvements.</p> <p>Systematically analyses and evaluates data and other evidence to formulate logical and highly relevant conclusions.</p>   | <p>Applies scientific concepts and evidence from investigations to present substantiated personal views and to suggest solutions to complex problems in new and familiar contexts.</p> <p>Uses appropriate scientific terms, conventions, formulae, and equations highly effectively.</p> <p>Demonstrates initiative in applying constructive and focused approaches to individual and collaborative work.</p> | <p>Consistently demonstrates a deep and broad knowledge and understanding of a range of scientific concepts.</p> <p>Uses knowledge of science perceptively and logically to understand and explain social or environmental issues.</p> <p>Applies a variety of forms to communicate knowledge and understanding of science coherently and highly effectively.</p> |
| <b>B</b> | <p>Designs and implements a well-considered and clear plan for a scientific investigation.</p> <p>Logically selects and appropriately acknowledges information about science and issues in science from different sources.</p> <p>Manipulates apparatus and technological tools carefully and mostly effectively using organised safe and ethical work practices.</p> <p>Obtains, records, and displays findings of investigations using appropriate conventions and formats mostly accurately and effectively.</p>   | <p>Uses clear and well-organised analytical skills to examine connections between data, concepts, and issues in science.</p> <p>Evaluates procedures and suggests some appropriate improvements.</p> <p>Uses mostly logical approaches to analyse and evaluate data and other evidence to formulate consistent and relevant conclusions.</p>     | <p>Applies scientific concepts and evidence from investigations to present logical personal views and to suggest solutions to problems in new and familiar contexts.</p> <p>Uses appropriate scientific terms, conventions, formulae, and equations effectively.</p> <p>Applies mostly constructive and focused approaches to individual and collaborative work.</p>   | <p>Demonstrates some depth and breadth of knowledge and understanding of a range of scientific concepts.</p> <p>Uses knowledge of science logically to understand and explain social or environmental issues.</p> <p>Applies a variety of forms to communicate knowledge and understanding of science coherently and effectively.</p>                             |
| <b>C</b> | <p>Designs and implements a considered and generally clear plan for a scientific investigation.</p> <p>Selects with some focus, and mostly appropriately acknowledges, information about science and issues in science.</p> <p>Manipulates apparatus and technological tools generally carefully and effectively using safe and ethical work practices.</p> <p>Obtains, records, and displays findings of investigations using generally appropriate conventions and formats with some errors but generally accurately and effectively.</p>                     | <p>Uses generally organised analytical skills to examine connections between data, concepts, and issues in science.</p> <p>Evaluates some procedures in science and suggests some improvements that are generally appropriate.</p> <p>Analyses and evaluates data and other evidence to formulate simple and generally relevant conclusions.</p> | <p>Applies scientific concepts and evidence from investigations to present reasonable personal views and to suggest some solutions to basic problems in new or familiar contexts.</p> <p>Uses generally appropriate scientific terms, conventions, formulae, and equations with some general effectiveness.</p> <p>Applies generally constructive approaches to individual and collaborative work.</p>         | <p>Demonstrates knowledge and understanding of a general range of scientific concepts.</p> <p>Uses knowledge of science with some logic to understand and explain one or more social or environmental issues.</p> <p>Applies a variety of forms to communicate knowledge and understanding of science with some general effectiveness.</p>                        |

|          | Investigation   | Analysis and Evaluation   | Application  | Knowledge and Understanding  |
|----------|---|---|--|--|
| <b>D</b> | <p>Prepares the outline of a scientific investigation.</p> <p>Selects and may partly acknowledge one or more sources of information about science or an issue in science.</p> <p>Uses apparatus and technological tools with inconsistent care and effectiveness and attempts to follow safe and ethical work practices.</p> <p>Obtains, records, and displays findings of investigations using conventions and formats inconsistently, with occasional accuracy and effectiveness.</p> | <p>Describes basic connections between some data, concepts, and issues in science.</p> <p>For some procedures, identifies improvements that may be made.</p> <p>Attempts to extract meaning from data and other observations and to formulate a simple conclusion that may be relevant.</p> | <p>Applies some evidence to describe some basic problems and identify one or more personal views and simple solutions, in familiar contexts.</p> <p>Attempts to use some scientific terms, conventions, formulae, and equations that may be appropriate.</p> <p>Attempts individual work inconsistently, and contributes superficially to aspects of collaborative work.</p> | <p>Demonstrates some basic knowledge and partial understanding of scientific concepts.</p> <p>Identifies and explains some scientific information that is relevant to one or more social or environmental issues.</p> <p>Communicates basic information to others using one or more forms.</p> |
| <b>E</b> | <p>Identifies a simple procedure for a scientific investigation.</p> <p>Identifies a source of information about science or an issue in science.</p> <p>Attempts to use apparatus and technological tools with limited effectiveness or attention to safe or ethical work practices.</p> <p>Attempts to record and display some descriptive information about an investigation, with limited accuracy or effectiveness.</p>   | <p>Acknowledges that connections exist between data, concepts, and/or social issues in science.</p> <p>Acknowledges the need for improvements in one or more procedures.</p> <p>Attempts to organise some limited data or observations.</p>   | <p>Identifies a basic problem and attempts to identify a personal view or solution in a familiar context.</p> <p>Uses some scientific terms or formulae.</p> <p>Shows emerging skills in individual and collaborative work.</p>  | <p>Demonstrates some limited recognition and awareness of scientific concepts.</p> <p>Shows an emerging understanding that some scientific information is relevant to social or environmental issues.</p> <p>Attempts to communicate information about science.</p>                            |